Before the
Federal Communications Commission
Washington, D.C. 20554

In the Matter of	)	
	)	
Allocation of Spectrum Below 5 GHz	)	ET Docket No. 94-32
Transferred from Federal Government Use	)	

FOURTH REPORT AND ORDER

Adopted: September 20, 1996 **Released: October 18, 1996**

By the Commission:

I. INTRODUCTION

1. By this action, the Commission addresses issues raised in the *First Report and Order and Second Notice of Proposed Rulemaking* (*First R&O and Second NPRM*) in this proceeding regarding sharing of the 2390-2400 MHz and 2402-2417 MHz bands by the Amateur Radio Service (amateur service) and unlicensed devices.[1] In particular, we find that the existing technical rules governing use of these bands are adequate and that no additional rules are needed. Thus, we adopt our earlier tentative conclusion that the amateur service, unlicensed Data Personal Communications (Data-PCS) devices, and other unlicensed Part 15 devices can share their respective bands under existing rules without additional regulations. We also, as was proposed, prohibit airborne use of unlicensed devices in the 2390-2400 MHz band, in order to protect space research operations. Finally, we conclude that Data-PCS and other Part 15 devices may each operate in the 2390-2400 MHz or the 2402-2417 MHz band, but must abide by the rules governing the band in which they operate.

II. BACKGROUND

2. The Omnibus Budget Reconciliation Act of 1993[2] (Reconciliation Act) required the Secretary of Commerce to identify at least 200 megahertz of spectrum currently allocated for use by Federal Government agencies that could be transferred to private sector use. The statute

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[1] *See* Allocation of Spectrum Below 5 GHz Transferred from Federal Government Use, ET Docket No. 94-32, *First Report and Order and Second Notice of Proposed Rulemaking*, 10 FCC Rcd 4769 (1995). *See also Notice of Inquiry*, 9 FCC Rcd 2175 (1994); *Notice of Proposed Rulemaking*, 9 FCC Rcd 6779 (1994); *Second Report and Order*, 11 FCC Rcd 624 (1995); and *Third Report and Order*, 10 FCC Rcd 13138 (1995).

[2] *Omnibus Budget Reconciliation Act of 1993*, Pub. L. No. 103-66, 107 Stat. 312 (enacted August 10, 1993).

further stipulated that all of the spectrum recommended for reallocation must be located at frequencies below 5 GHz, with at least 100 megahertz of this spectrum being below 3 GHz. The Reconciliation Act also required the Secretary of Commerce to issue within six months of its enactment a preliminary report identifying potential reallocable bands of frequencies and to issue within 18 months a final report recommending specific spectrum for reallocation.[3] In its preliminary report, the Department of Commerce was required to identify at least 50 megahertz of spectrum for immediate reallocation, with a significant portion of the spectrum to be reserved until after a ten-year period.[4] The remaining spectrum is to be made available over a ten-year period.[5]

3. In accordance with the requirements of the Reconciliation Act, on February 10, 1994, the Department of Commerce released a report preliminarily identifying spectrum for reallocation (Preliminary Report).[6] Three of these frequency bands, 2390-2400 MHz, 2402-2417 MHz, and 4660-4685 MHz, a total of 50 megahertz, were identified for immediate reallocation and are now available for private sector use.[7] The Reconciliation Act also required that the Commission allocate, and propose regulations to assign, this 50 megahertz of spectrum no later than 18 months after its enactment (*i.e.*, by February 10, 1995).[8] In February 1995, the Department of Commerce released a final report identifying the frequency bands for reallocation; these bands are listed in Appendix A.[9]

4. On February 7, 1995, we adopted the *First R&O and Second NPRM* in this proceeding. In the *First R&O and Second NPRM*, we opened the 2390-2400 MHz band for use by Data-PCS devices; provided for continued use of the 2402-2417 MHz band by unlicensed devices operating in accordance with Part 15 of our Rules; upgraded the amateur service allocation for both of these bands from secondary to primary; and allocated the 4660-4685 MHz band for fixed and mobile services. The *First R&O and Second NPRM* also proposed to

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[3] *See* 47 U.S.C. § 923.

[4] At least one-half of the 50 megahertz identified for immediate reallocation must be below 3 GHz and all of it must be identified for exclusive non-Federal use. *See* 47 U.S.C. § 923(e)(2)(A) and (B).

[5] *See* 47 U.S.C. §§ 923(e)(3) and 925(b).

[6] *Preliminary Spectrum Reallocation Report*, U.S. Department of Commerce, NTIA Special Publication 94-27, February, 1994.

[7] By letter dated October 27, 1994, the President of the United States notified the Chairman of the Commission that Federal Government frequency assignments in these bands have been withdrawn and that the National Table of Frequency Allocations has been modified to reflect the reallocation of these bands.

[8] *See* 47 U.S.C. § 925(a).

[9] *See Spectrum Reallocation Final Report*, U.S. Department of Commerce, NTIA Special Publication 95-32, February, 1995.

designate the 4660-4685 MHz band for General Wireless Communications Services (GWCS), and the GWCS allocation and service rules were finalized in the *Second Report and Order* in this proceeding.[10]

5. In the *First R&O and Second NPRM*, we stated that it was unnecessary to seek comment on service rules for the 2390-2400 MHz band because rules governing Data-PCS are already in place and would be applied in this band. In addition, we stated that Data-PCS and amateur service use of 2390-2400 MHz will generally be compatible and that it was unnecessary to propose any formal standards for sharing between the services in this band. We requested comment on whether this conclusion is appropriate or whether formal sharing or coordination requirements are needed. Similarly, we stated that both the amateur service and Part 15 operations at 2402-2417 MHz would continue to be governed in accordance with currently applicable technical and operational rules but requested comment on whether any changes to our rules are necessary to facilitate more effective sharing by the amateur service and these Part 15 devices.

6. We also proposed to prohibit airborne use of Data-PCS devices operating at 2390-2400 MHz in order to protect planetary research radar operations conducted at 2380 MHz by the National Astronomy and Ionospheric Center (NAIC) at Arecibo, Puerto Rico. We requested comment on whether this would provide reasonable protection to space research operations, and if not, what additional steps should be taken to provide greater protection. Finally, we requested comment on whether to allow accommodation of operations that combine use of the 2390-2400 MHz band and the adjacent 2400-2483.5 MHz band. We stated that comments supporting combined use of these bands should provide recommendations on appropriate technical standards.

7. We received nineteen comments and seven reply comments in response to the proposals concerning the 2390-2400 MHz and 2402-2417 MHz bands in the *First R&O and Second NPRM*.[11] Comments on these two bands were generally filed by the amateur community, parties with interest in unlicensed devices, and parties interested in protecting space research operations at the NAIC. The comments generally support the allocation of these bands to the amateur service and state that no further regulation is necessary to facilitate sharing of the bands. Most comments oppose permitting combined use of the bands by unlicensed devices, although a few parties support this concept. Further, most parties argue that amateur operations and unlicensed device operations will not cause significant interference problems to radio astronomy operations as long as airborne use of unlicensed devices is not permitted. Finally, several parties with interests in unlicensed devices suggest increasing the allocation status for unlicensed devices, while the amateur comments oppose such an action.

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[10] *Second Report and Order*, 11 FCC Rcd 624 (1995).

[11] Comments and reply comments that relate only to the GWCS at 4660-4685 MHz are not included in these numbers because they were addressed in the *Second Report and Order*. This Order addresses the *First R&O and Second NPRM* as it relates to the 2390-2400 MHz and 2402-2417 MHz bands only. Comments and replies are listed as Appendix D.

III. DISCUSSION

A. *Band Sharing.*

8. In the *First R&O and Second NPRM*, we stated our belief that Data-PCS and amateur service use of 2390-2400 MHz will generally be compatible and that it is unnecessary to propose any formal standards for sharing between these services in this band.[12] We requested comment on whether this conclusion is appropriate or whether there is a need to restrict certain uses by either the amateur service or Data-PCS devices that might be particularly disruptive, or whether we should seek to implement formal procedures for coordination of amateur/Data-PCS use. We also sought comment on whether any changes should be made to our rules to facilitate use of the 2402-2417 MHz band by the amateur service and Part 15 devices.

9. *Comments.* The majority of the comments are opposed to any change in service rules and argue that additional regulations would be of limited benefit in facilitating sharing. The American Radio Relay League (ARRL), the Radio Amateur Satellite Corporation (AMSAT), and the Southern California Repeater and Remote Base Association (SCRRBA) state that there is no need for further rule changes.[13]

10. Apple Computer, Inc. (Apple), Compaq Computer Corporation (Compaq), and Motorola, Inc. (Motorola) contend that adequate Data-PCS rules already exist, and no further regulation is needed. Compaq states that in the rare event of interference, it would affect the Data-PCS user and not the amateur operation, because of the packetized nature of Data-PCS and the higher power of amateur operations.[14] Motorola cautions that the Data-PCS etiquette is theoretical and may have to be revisited after it is tested in a real-world environment.[15] ARRL states that it has evaluated data provided by Apple Computer and determined that sharing between Data-PCS and the amateur service is possible. ARRL also points out that the primary status of the amateur service in both the 2390-2400 MHz and the 2402-2417 MHz bands should be sufficient to protect amateur operations from interference.[16] ARRL and AMSAT request that the Commission refrain from making further sharing or coordination rules for either band. Finally, Apple, Compaq and ARRL agree that interference problems should be resolved outside a formal set of regulatory requirements on a case-by-case basis.

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[12] *See First R&O and Second NPRM* at ¶ 57.

[13] *See* ARRL Comments at i, AMSAT Comments at 4, SCRRBA Comments at 8.

[14] *See* Compaq Comments at 2-3.

[15] *See* Motorola Comments at 11.

[16] *See* ARRL Reply at 5-6.

11. On the other hand, James S. Kaplan (Kaplan), an amateur licensee, requests that the Commission adopt strict non-interference rules to protect amateur satellite operations at 2400-2410 MHz. Kaplan submits that Data-PCS should not be permitted in the 2400-2410 MHz and 2433-2438 MHz bands, and that other Part 15 devices should not be allowed to operate with more than 50 millivolts per meter in these bands.[17] The Northern California Packet Association (NCPA) requests that the Commission specify the procedure for amateurs to coordinate with the operators of Data-PCS and other Part 15 equipment. Additionally, NCPA argues that business users of unlicensed equipment should file information identifying their locations and persons responsible for the equipment.[18] Regarding potential Data-PCS interference to amateur operations, Apple replies that commenters' concerns are based on a lack of understanding of the existing restrictions on Data-PCS operations.[19]

12. AT&T Corporation (AT&T) argues that a cooperative study should be performed by the manufacturers of unlicensed devices and the amateur community to determine any needed rules governing sharing of the bands. AT&T argues that neither the amateur service nor Part 15 manufacturers can predict whether they will be able to share the 2402-2417 MHz band, because both amateur operations and unlicensed device operations are still growing in the band. Therefore, AT&T proposes that we defer decision on the band sharing issues raised in the *First R&O and Second NPRM*, pending more study.[20] ARRL supports further testing to determine whether there are interference problems that should be addressed, but opposes AT&T's suggestion that the decision on sharing rules be deferred pending the outcome of further tests because such a deferral would discourage amateurs from making use of the band.[21]

13. Finally, NCPA argues that high-gain antennas should not be permitted for unlicensed device operations. Similarly, ARRL expresses concern that the Commission has issued waivers to allow the use of high-gain directional antennas by spread spectrum wireless Local Area Networks (LAN) devices operating above 2400 MHz. Such devices are capable of communicating to 25 miles, which increases their potential to cause interference. ARRL opposes issuance of such waivers, arguing that in no case should such systems be permitted to operate below 2400 MHz.[22]

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[17] *See* Kaplan Comments at 5.

[18] *See* NCPA Comments at 3.

[19] *See* Apple Reply at 4.

[20] *See* AT&T Comments at 4-5.

[21] *See* ARRL Reply at 12.

[22] *See* ARRL Reply at 13.

14. *Decision.* We agree with the majority of commenters that changes to the service rules for amateur, Data-PCS, and other Part 15 operations would be of limited benefit to these services. History and the record indicate compatibility between amateur and unlicensed device operations. Additionally, the low power of Data-PCS and other Part 15 operations decreases the probability of interference to amateur operations. Finally, comments to the *First R&O and Second NPRM* indicate a desire by the parties involved to resolve interference problems informally, rather than having the Commission establish additional regulations.

15. Regarding Kaplan's request for strict non-interference rules for Data-PCS, we do not think that such rules are necessary, because we agree with ARRL that the primary allocation status of the amateur service in both bands is sufficient to protect amateur operations from any rare cases of interference by Data-PCS. In addition, we defer consideration of NCPA's suggestion that restrictions be placed on the use of high-gain antennas by unlicensed devices to the Spread Spectrum Transmitter proceeding, in which we will address issues concerning the use of high-gain antennas.[23]

16. Further, we do not believe that formal coordination procedures are needed for amateur operations to share spectrum with unlicensed device operations. Such formal coordination procedures would increase costs and delay use of the spectrum. We agree with comments that amateur and Part 15 devices currently share the 2402-2417 MHz band and that Data-PCS rules were designed to facilitate sharing. Therefore, additional sharing requirements are not necessary.

17. At this time, we do not believe, as AT&T suggests, that the sharing issues raised in the *First R&O and Second NPRM* should be deferred until a cooperative study can be completed by amateur interests and Part 15 manufacturers. Several commenters indicate a desire to perform additional testing of the sharing potential of these bands, but most recommend that the Commission maintain its current rules and permit spectrum users to resolve spectrum issues informally. We do not believe it is necessary or in the public's interest to delay the use of these bands pending further study. Should further testing reveal an impasse between the interested parties, the issue could then be brought to the Commission.

B. *Protection of Space Research.*

18. In the *First R&O and Second NPRM*, we proposed to prohibit airborne use of unlicensed Data-PCS devices in the 2390-2400 MHz band, in order to protect space research operations at 2380 MHz. At the same time, we declined to prohibit terrestrial use of Data-PCS devices in the 2390-2400 MHz band in the vicinity of the NAIC, because the nomadic nature of these devices makes it difficult to enforce such a restriction, and because the low power of these devices should provide sufficient protection from interference from ground-based Data-PCS

[23] *See Amendment of Parts 2 and 15 of the Commission's Rules Regarding Spread Spectrum Transmitters*, ET Docket No. 96-8, Notice of Proposed Rule Making, 11 FCC Rcd 3068 (1996).

devices to space research operations. We requested comment on whether these measures were sufficient to protect space research from harmful interference, and on whether any other restrictions on unlicensed device or amateur operations in the 2390-2400 MHz and 2402-2417 MHz bands would be needed to protect space research.[24]

19. *Comments.* Cornell University (Cornell) and the Committee on Radio Frequencies of the National Academy of Sciences (CORF) support the proposed prohibition on airborne use of unlicensed devices in the 2390-2400 MHz band. Cornell and CORF further request that we prohibit all airborne use, and terrestrial use within 30 miles of the NAIC, of Part 15 devices in the 2402-2417 MHz band, modify our Part 15 rules to state that point-to-point data links are not to be operated in a manner which interferes with space research at the NAIC, and require advance coordination with the NAIC of any Part 15 point-to-point operations within 10 miles of the NAIC.[25]

20. Apple states that Data-PCS devices will not interfere with the NAIC unless they are operated in its immediate vicinity. Apple agrees that airborne use of Data-PCS devices should be prohibited in the vicinity of the NAIC . Apple also states that tightening out-of-band emission standards in Section 15.321(d) of our rules merits additional study. Lowering the permitted out-of-band emissions may be necessary to protect space research operations from harmful interference, according to Apple, but it would increase the cost of the Data-PCS devices and could reduce availability to some segments of the population if applied to all Data-PCS devices.[26] Apple states that it would serve the public to ascertain the maximum level of spurious emissions from Data-PCS devices that can be tolerated by the NAIC and develop an approach to assure that this level is not exceeded while imposing the smallest burden possible on Data-PCS. Apple states that it and NAIC representatives have had preliminary discussions aimed at resolving these open questions and urges the Commission not to impose any new technical requirements, because the parties will develop a mutually acceptable sharing approach. Apple states that the airborne ban on Data-PCS devices near Puerto Rico can only be imposed upon users rather than manufacturers, because it is not practical for a manufacturer to design a device to cease operations at a particular location.[27] Although Apple agrees that Data-PCS should not be operated in a manner that interferes with the NAIC, it opposes a specific regulatory prohibition on such interference.

21. The Part 15 Coalition asserts that no Part 15 rule changes are necessary to protect space research operations at the NAIC. The Part 15 Coalition claims that the National Research Council (NRC) was mainly concerned with interference from the fixed and mobile services, not

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[24] *See First R&O and Second NPRM* at ¶¶ 56 and 59.

[25] *See* Cornell Comments at 3, CORF Comments at 5.

[26] *See* Apple Comments at 4-5.

[27] *See* Apple Reply at 3.

from unlicensed device operations.[28] Finally, ARRL states that amateur operations will not cause interference to the NAIC, but if such interference were to occur, reliance can be placed on the successful history the NAIC and amateurs have of solving interference problems. Kaplan states that amateurs should not be prohibited from airborne or space-to-earth operations in order to protect astronomy operations.[29]

22. *Decision.* We are encouraged by the comments in this proceeding which generally agree that space research operations are important and which show a willingness by entities to protect such operations. The record indicates that operations of Data-PCS devices in the 2390-2400 MHz band from aircraft while airborne could interfere with the operations of the NAIC, which operates a planetary research radar at 2380 MHz. None of the commenters in this proceeding have indicated that there is a current demand for airborne operations in this band. Accordingly, we will adopt our proposed ban of airborne use of all unlicensed devices in the 2390-2400 MHz band in the entire United States. We do this because airborne operations in this band could cause interference to the extremely sensitive receivers at the NAIC from distances up to 800 miles. It is generally impracticable to prohibit only airborne operations within 800 miles of the NAIC and expect users of unlicensed devices to be aware of when they are within the prohibited area. As a result, we find that only a complete ban on the use of unlicensed devices in the 2390-2400 MHz band from aircraft while airborne will suffice to protect space research operations at the NAIC. We will, however, consider waiver requests on a case-by-case basis by users who desire to engage in airborne operations in this band and who can demonstrate that they will not operate within 800 miles of the NAIC. We delegate authority to the Chief, Office of Engineering and Technology to rule on such waiver requests in the first instance. Further, we agree with Apple that manufacturers should not be held responsible for designing devices to cease operations while traveling in aircraft; rather, it will be the responsibility of the user to control when and where the device is used. However, we believe that Part 15 operations at 2402-2417 MHz are sufficiently removed from 2380 MHz and are subject to sufficient restrictions on spurious emissions as not to warrant a similar airborne restriction.[30] As to amateur operations, we will not impose a formal restriction on airborne usage. We believe such a restriction would serve no useful purpose, given that airborne usage by amateur operators in the 2390-2400 MHz band is extremely rare, that the NAIC has not indicated that such a restriction is needed, and that amateur operators and the NAIC share a highly successful history of informal cooperation in resolving interference concerns. We also decline to adopt limitations on the terrestrial use of these bands by Data-PCS devices, other Part 15 devices, or amateur operations. Because unlicensed devices are of low power, and are typically nomadic in nature, we find it unlikely that they will cause significant interference to the NAIC when they are operated on the ground. Amateur operations have a history of mutually satisfactory coordination with space research

[28] *See* Part 15 Coalition Comments at 8.

[29] *See* Kaplan Comments at 5.

[30] We note that Part 15 devices are not permitted to operate in the 2310-2390 MHz band, and our rules limit the amount of spurious emissions which Part 15 devices are permitted to cause in that band. *See* 47 C.F.R. § 15.205.

operations, and we see no reason why this should not continue. Therefore, we see no immediate need for restrictions on terrestrial operations in either the 2390-2400 MHz or the 2402-2417 MHz bands. We note, however, that in ET Docket No. 96-2 we are currently considering whether to establish a radio astronomy coordination zone around the NAIC facility in Arecibo, Puerto Rico, and we may revisit this issue in that proceeding.[31]

23. We deny Cornell's and CORF's request to modify Section 15.321 of our rules to protect the NAIC from Part 15 point-to-point data links and their request that any fixed user within 10 miles of the NAIC be required to coordinate such operations, as we believe these actions are unnecessary. That is, we note that all Part 15 devices must operate on a non-interference basis and that there is no need to modify Part 15 to specify this requirement further.[32]

C. *Combined Operations.*

24. In the *First R&O and Second NPRM*, we noted that the existing Part 15 rules effectively preclude operations that would combine the 2390-2400 MHz band with the superjacent 2400-2483.5 MHz band into a single, large Part 15 band. We therefore sought comment on whether some allowance should be made to accommodate operations that combine the use of these two bands. We also asked that parties pursuing combined use of the bands provide recommendations on appropriate technical standards to be used for such operations. Five parties address this issue in their comments. AT&T recommends that the two bands be combined, and states that creating a single band from 2390-2483.5 MHz could create capability for improving the performance by Data-PCS and spread spectrum devices. AT&T stresses that such action would allow spread spectrum devices to operate in spectrum further removed from that used by industrial, scientific, and medical devices, centered at 2450 MHz, which can cause harmful interference to unlicensed devices.[33] AT&T suggests requiring asynchronous Data-PCS devices in the 2400-2483.5 MHz band to conform to the rules governing that band,[34] and other Part 15 devices in the 2390-2400 MHz portion of the band to likewise conform to the rules governing that band.[35] AT&T states that combined use in this manner would induce industry to invest in equipment development.[36]

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[31] *See Amendment to Establish a Radio Astronomy Coordination Zone in Puerto Rico*, Notice of Proposed Rule Making, ET Docket No. 96-2, 11 FCC Rcd 1716, 61 Fed. Reg. 10709 (March 15, 1996).

[32] *See* 47 C.F.R. § 15.5.

[33] *See* AT&T Comments at 2-3.

[34] *See* 47 C.F.R. §§ 15.247, 15.249.

[35] *See* 47 C.F.R. §§ 15.319, 15.321, 15.323.

[36] *See* AT&T Reply at 3.

25. Apple states that if we were to permit devices operating only under the rules governing the 2400-2483.5 MHz band to operate in the 2390-2400 MHz band, isochronous devices would soon monopolize the band, rendering it of little value to Data-PCS devices, which operate under a spectrum etiquette.[37] Apple agrees, however, with AT&T's band combination idea, provided that devices in each portion of the band adhere to the relevant technical rules.[38] ARRL opposes combining the 2390-2400 MHz and 2400-2483.5 MHz bands, arguing that the issue has not been discussed previously in this proceeding, and that while Data-PCS and the amateur service can share the 2390-2400 MHz band, opening the band to non-Data-PCS Part 15 devices would be detrimental to both services.[39] ARRL asserts that there is no need to combine the bands, and that any combination of the bands should be addressed, if at all, in the upcoming proceeding to allocate the bands 2400-2402 MHz and 2417-2450 MHz when they are transferred from Government use. Compaq agrees that there is no need to combine the 2390-2400 MHz and 2400-2483.5 MHz bands, and states that other Part 15 devices do not have communications protocols compatible with Data-PCS protocols. Compaq argues that such sharing should generally be forbidden, and that the Commission should issue waivers to this rule upon appropriate showing of technical compatibility.[40] AMSAT points out that the Data-PCS rules were designed specifically with sharing in mind, and that this is not true in the case of other Part 15 devices.[41]

26. *Decision.* Under our current rules, Data-PCS devices and other Part 15 devices may operate in both the 2390-2400 MHz and 2400-2483.5 MHz bands, provided each device conforms to the technical rules of the particular band in which it operates. We agree with Apple that non-Data-PCS Part 15 applications would generally not meet the technical requirements of the 2390-2400 MHz band. Thus, if we were to combine the two bands, we would have to apply either the non-Data-PCS rules to the entire band, which would hinder or preclude the development of Data-PCS, or apply the Data-PCS rules to the entire band, which would sharply limit its utility to Part 15 devices. On the other hand, we find no reason to prevent non-Data-PCS Part 15 devices that do meet the technical requirements of the 2390-2400 MHz band from operating there, nor to limit Data-PCS devices to that band only. For this reason, Data-PCS and other Part 15 devices may operate in either the 2390-2400 MHz band or the 2400-2483.5 MHz band, if they adhere to the rules governing the band in which they operate. A device complying with the technical requirements of both the 2390-2400 MHz and the 2400-2483.5 MHz band is allowed to operate in either band under our current rules. No commenter supports restricting this

[37] *See* Apple Comments at 2-3.

[38] *See* Apple Reply at 2.

[39] *See* ARRL Comments at 7.

[40] *See* Compaq Comments at 5.

[41] *See* AMSAT Comments at 3.

flexibility, and we see no reason to change our standards, which currently allow maximum operational freedom consistent with the prevention of harmful interference.

D. *Other Issues.*

27. Several parties with interests in unlicensed devices requested that the allocation for unlicensed devices in this proceeding be upgraded to a primary allocation or that these devices receive some sort of additional rights to the spectrum. Some amateur comments requested that guard bands be established around their operations in order to protect amateur stations from interference caused by unlicensed devices. Finally, one party expressed concern that electronic equipment that can eavesdrop on the operation of wireless telephones and other data communications devices might be outlawed.

28. *Comments.* Cylink Corporation (Cylink), Motorola, the Part 15 Coalition, UTC, and the Consumer Electronics Group of the Electronics Industries Association (EIA) support an increased allocation status for unlicensed device operations. Motorola argues that the market has a negative perception of unlicensed Data-PCS devices because its non-allocated, at-sufferance status does not protect the service.[42] Motorola contends that an alternative to a primary allocation for Data-PCS would be to define a parameter under which Data-PCS devices are presumed not to cause interference.[43] Motorola argues that this would permit Data-PCS to operate without the threat of an amateur licensee requesting cessation of such operations. In its reply comments, AT&T states that Part 15 operations may need to be made co-primary in order to ensure their right to share with amateur operations. However, AT&T urges, if the Commission is not now prepared to increase the allocation status of unlicensed devices, it should leave itself open to such a change in the future.[44]

29. Similarly, the Part 15 Coalition supports the creation of a "Part 16" which would provide unlicensed devices the protection of primary status. The Part 15 Coalition argues that the creation of "Part 16" would provide a long-term stable regulatory environment for unlicensed operations. The Part 15 Coalition states that this protection becomes increasingly important as Part 15 devices become more sophisticated and ubiquitous. Additionally, the Part 15 Coalition requests that Part 15 devices be afforded increased interference protection from ISM devices sharing the 2400-2483.5 MHz band by requiring ISM operations to take measures to minimize in-band interference.[45] UTC agrees with the proposal to create a Part 16, stating that unlicensed

[42] *See* Motorola Comments at 2-4.

[43] *See* Motorola Comments at 12. Specifically, Motorola recommends that the Data-PCS device parameter be an average Equivalent Isotropically Radiated Power (EIRP) of 25 milliwatts or less measured in a 1 megahertz bandwidth over a period of one second.

[44] *See* AT&T Reply at 4.

[45] *See* Part 15 Coalition Comments at 6.

devices needed by utilities and pipelines require significant capital expenditures, and that interference protection is necessary to justify such expenditures.[46]

30. ARRL opposes an increase in the allocation status of Part 15 devices in the 2402-2417 MHz band because significant interference to amateur operations from ISM devices already exists in this band, and low power Part 15 devices are the only operations that can share the band with amateur and ISM operations without increasing mutual interference to an unacceptable level. Likewise, SCRRBA argues that giving Part 15 devices primary status would effectively eliminate the amateur service in this band.[47] AMSAT is also opposed to the establishment of a Part 16 operation on this spectrum.[48]

31. In its reply comments, ARRL argues that supporters of primary status for unlicensed devices do not suggest that it is necessary for interference concerns; rather primary status is allegedly needed so that consumers of Part 15 devices perceive their devices as reliable and protected from interference. ARRL asserts that there is no evidence that Part 15 device consumers have developed a negative perception toward such devices under the current rules, nor is there evidence that amateurs have arbitrarily claimed interference. ARRL argues that users of these devices benefit from their unlicensed status; in fairness they cannot at the same time request protection from interference or entitlement to interfere with licensed services.[49] Similarly, AMSAT argues that although these devices do not have priority in the bands in which they are used, their users do benefit because the devices do not have to be licensed, can operate with some degree of frequency agility and bandwidth variability, and can be used for an infinite number of purposes without eligibility requirements imposed upon the user. AMSAT also states that entitling unlicensed operations to the benefits of licensed operations, without any of the obligations attendant to licensed use, would increase the administrative burdens on the Commission.[50] Finally, ARRL argues that Part 15 operations cannot receive primary status under the current language in the Communications Act of 1934, as amended, claiming that the only authority the Commission has to permit unlicensed devices is restricted to radio control devices and the Citizens' Band Radio Service.[51]

32. A few amateur comments request that a guard band be established to protect amateur satellite operations at 2400-2410 MHz. Specifically, Kaplan and the Northern Amateur

[46] *See* UTC Comments at 3.

[47] *See* SCRRBA Comments at 4.

[48] *See* AMSAT Comments at 4.

[49] *See* ARRL Reply at 8.

[50] *See* AMSAT Comments at 6-7.

[51] *See* ARRL Comments at 8; *see generally* 47 U.S.C. § 307(e).

Relay Council of California, Inc. (NARCC) request that the 2399-2400 MHz and 2410-2411 MHz bands be designated as guard bands. AMSAT requests that the guard band cover the 2400-2410 MHz band or at least the 2400-2402 MHz band. Additionally, NARCC claims that it is uncertain how Data-PCS will effect amateur operations and therefore recommends that portions of the band be allocated exclusively for amateur and Part 15 operations, and another portion could be opened to all three services: the amateur service, Data-PCS, and other Part 15 devices. Apple replies that these arguments do not address sharing standards or propose restrictions on any particular potential interference source; rather, they seek to reverse an allocation that is already made and therefore should not be considered.[52]

33. Finally, the NCPA expresses concern that Part 15 and Data-PCS manufacturers will seek to outlaw electronic equipment that can eavesdrop on the operation of wireless telephones and other data communications devices operating in the 2390-2400 MHz and 2402-2417 MHz bands. NCPA contends that amateurs use such equipment to communicate in these bands and the equipment should not be prohibited, urging the Commission to protect the right of any person to purchase equipment capable of receiving signals in the 2390-2417 MHz band. NCPA also argues that the protection given to unlicensed users makes it difficult for amateur operators to determine sources of interference problems because encrypted unlicensed signals are difficult to track. Additionally, NCPA argues that amateurs are required to identify their transmitters, but no provision exists for unlicensed operators to identify themselves. NCPA requests that business users be required to transmit occasional unencrypted identification.[53]

34. *Decision.* Regarding requests that unlicensed devices receive an increase in allocation status or additional rights to the spectrum, we do not believe this is the appropriate proceeding to address this issue. The allocation status of the 2390-2400 MHz and 2402-2417 MHz bands was determined in the *First R&O and Second NPRM.* Further, we note that unlicensed devices enjoy a certain flexibility with their unlicensed status and are being effectively used under existing rules. In this regard, we deny Motorola's proposal to establish an operating parameter under which Part 15 devices would be presumed not to cause interference. Accordingly, we will not grant unlicensed devices additional rights to the spectrum at this time; however, if problems develop, we will consider this issue at that time. Finally, we deny the Part 15 Coalition's request that additional regulations be placed on ISM operations to protect unlicensed operations because unlicensed operations have successfully shared spectrum with ISM operations in the past. Adding further regulations for ISM operations would unnecessarily restrict those operations, with dubious benefit to Part 15 operations.

35. Regarding amateur requests for the establishment of guard bands, we believe that such requests would effectively change the allocation adopted in the *First R&O and Second NPRM.* The guard bands requested in the comments would effectively preclude unlicensed device

[52] *See* Apple Reply at 5.

[53] *See* NCPA Comments at 2-3.

operations from spectrum that was allocated for such purposes. The interested parties would have had to file a petition for reconsideration to the allocation, rather than comments to the notice portion of the *First R&O and Second NPRM* to warrant Commission consideration of such action.

36. Finally, regarding NCPA's concern that Part 15 and Data-PCS manufacturers will seek to outlaw electronic equipment that can eavesdrop on the wireless operations, we note that it is already unlawful to eavesdrop on wireless telephone and similar communications devices.[54] Additionally, we will not require that unlicensed device users transmit an identification signal because we find such actions unnecessary. The record in this proceeding demonstrates that unlicensed device interference to amateur operations is the exception, not the norm, and the establishment of unwarranted changes to Part 15 is not in the public interest.

IV. ORDERING CLAUSE

37. IT IS ORDERED that Parts 15 and 97 of the Commission's Rules ARE AMENDED as specified in Appendix B, effective 30 days after publication in the Federal Register. Authority for issuance of this *Fourth Report and Order* is contained in Sections 4(i), 302, 303(g), 303(r), 309(j), 332(a), and 403 of the Communications Act of 1934, as amended, 47 U.S.C. §§ 154(i), 302, 303(g), 303(r), 309(j), 332(a), and 403, and Section 115(a) of the National Telecommunications and Information Administration Organization Act, 47 U.S.C. § 925(a).

V. PROCEDURAL MATTERS

Regulatory Flexibility Analysis

38. A Final Regulatory Flexibility Act Statement is contained in Appendix C of this *Fourth Report and Order.*

Contact Persons

39. For further information concerning this proceeding, contact Tom Derenge at (202) 418-2451, or Sean White at (202) 418-2453, Office of Engineering and Technology.

FEDERAL COMMUNICATIONS COMMISSION

William F. Caton
Acting Secretary

[54] *See* 18 U.S.C. §§ 2510-2521.

Appendix A:
NTIA Spectrum Reallocation Plan

Band Identified for Reallocation (MHz)	Reallocation Status	Reallocation Schedule
1390-1400	Exclusive	January 1999
1427-1432	Exclusive	January 1999
1670-1675	Mixed	January 1999
1710-1755	Mixed	January 1999/2004
2300-2310	Exclusive	Immediate
2390-2400	Exclusive	Reallocation Complete
2400-2402	Exclusive	Immediate
2402-2417	Exclusive	Reallocation Complete
2417-2450	Mixed	Immediate
3650-3700	Mixed	January 1999
4635-4660	Exclusive	January 1997
4660-4685	Exclusive	Reallocation Complete

Appendix B: Final Rules

A. Part 15 of Title 47 of the Code of Federal Regulation is amended as follows:

PART 15 -- RADIO FREQUENCY DEVICES

1. The authority citation for Part 15 continues to read as follows:

Authority: Secs. 4, 302, 303, 304, 307 and 624A of the Communications Act of 1934, as amended, 47 U.S.C. 154, 302, 303, 304, 307 and 544A.

2. Section 15.321 is amended by adding paragraph (g) to read as follows:

§ 15.321 Specific requirements for asynchronous devices operating in the 1910-1920 MHz and 2390-2400 MHz bands.

* * * * *

(g) Operation of devices in the 2390-2400 MHz band from aircraft while airborne is prohibited, in order to protect space research operations at the National Astronomy and Ionospheric Center at Arecibo, Puerto Rico.

B. Part 97 of Title 47 of the Code of Federal Regulation is amended as follows:

PART 97 -- AMATEUR RADIO SERVICE

1. The authority citation for Part 97 continues to read as follows:

Authority: 48 Stat. 1066, 1082, as amended; 47 U.S.C. 154, 303. Interpret or apply 48 Stat. 1064-1068, 1081-1105, as amended; 47 U.S.C. 151-155, 301-609, unless otherwise noted.

2. Section 97.303(j)(2) is revised to read as follows:

§ 97.303 Frequency sharing requirements.

* * * * *

(j) In the 13 cm band:

* * * * *

(2) In the United States, the 2300-2310 MHz segment is allocated to the amateur service on a co-secondary basis with the Government fixed and mobile services. In this segment, the fixed and mobile services must not cause harmful interference to the amateur service. The 2390-2400 MHz and 2402-2417 MHz segments are allocated to the amateur service on a primary basis. No amateur station transmitting in the 2400-2450 MHz segment is protected

from interference due to the operation of industrial, scientific, and medical devices on 2450 MHz.

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Appendix C: Final Regulatory Flexibility Analysis

1. As required by Section 603 of the Regulatory Flexibility Act, 5 U.S.C. § 603 (RFA), an Initial Regulatory Flexibility Analysis (IRFA) was incorporated in the *First Report and Order and Second Notice of Proposed Rule Making*, (*First R&O and Second NPRM)*, ET Docket No. 94-32.[55] The Commission sought written public comments on proposals in the *First R&O and Second NPRM*, including the IRFA. The Commission's Final Regulatory Flexibility Analysis (FRFA) in this Fourth Report and Order conforms to the RFA, as amended by the Contract With America Advancement Act of 1996 (CWAAA), Pub. L. No. 104-121, 110 Stat. 847 (1996).[56]

2. ***Need for and Objectives of the Rule:*** This action is taken in response to the Reconciliation Act,[57] which required the Secretary of Commerce to identify 200 megahertz of spectrum, currently allocated for use by Federal Government agencies, that could be transferred for private sector use, and in response to the ensuing Preliminary Spectrum Reallocation Report published by the Department of Commerce,[58] which identified such spectrum. The *First Report and Order and Second Notice of Proposed Rule Making* in this proceeding allocated the 2390-2400 MHz band to the Amateur Radio Service and Data-PCS, the 2402-2417 MHz band to the Amateur Radio Service, and the 4660-4685 MHz band to the Fixed and Mobile Services. It also inquired as to whether we should prohibit aeronautical use of Data-PCS or other unlicensed devices to protect space research operations at the National Astronomy and Ionospheric Center (NAIC) at Arecibo, Puerto Rico, as well as whether we should allow Data-PCS devices to operate in the 2400-2483.5 MHz band where other unlicensed devices operate, and vice versa. The allocation of Data-PCS spectrum is intended to provide enhanced communication service to the American public, while also creating new jobs, fostering economic growth, and increasing access to communications for industry and the public. The upgrade to primary status of the amateur allocation in this spectrum will encourage amateur operators to use this spectrum. Therefore, the Commission adopts rules prohibiting the use of Data-PCS devices in the 2390-2400 MHz band while airborne, in order to protect space research operations at the NAIC.

3. ***Summary of Significant Issues Raised by Public Comments in Response to the IRFA:*** No comments directly responded to the IRFA. In general comments on the *First R&O and Second NPRM*, however, some commenters raised an issue that might affect small

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[55] See 10 FCC Rcd 4769 (1995).

[56] Subtitle II of the CWAAA is "The Small Business Regulatory Enforcement Fairness Act of 1996" (SBREFA), codified at 5 U.S.C. § 601 *et seq.*

[57] Omnibus Budget Reconciliation Act of 1993, Pub. L. No. 103-66, 107 Stat 312 (enacted August 10, 1993).

[58] See Spectrum Reallocation Final Report, U.S. Department of Commerce, NTIA, Special Publication 95-32, February 1995.

entities. Some commenters argued that merging the 2390-2400 MHz band with the superjacent 2400-2483.5 MHz band into a single, large band for non-Data-PCS devices would make the spectrum more useful to manufacturers and users of unlicensed spread spectrum equipment, some of whom may be small entities. Because Data-PCS devices are asynchronous devices and follow a special spectrum sharing etiquette, while other Part 15 unlicensed devices are typically isochronous and do not adhere to a spectrum sharing etiquette, the Commission determined that combining the bands presented a significant danger of delaying or hampering the growth of Data-PCS through interference from other unlicensed devices. Manufacturers and users of Data-PCS devices may also be small entities, and the Commission declined to combine the bands because of the potential for mutual harmful interference between Data-PCS devices and other unlicensed devices.

4. ***Description and Estimate of the Number of Small Entities to Which the Rules Will Apply:*** The rule adopted in this Fourth Report and Order will apply to any small entity using Data-PCS devices while airborne in the continental United States. Because Data-PCS is as yet undeveloped, no meaningful estimate of the number or description of such small entities is possible. Since the Regulatory Flexibility Act amendments were not in effect until the record in this proceeding was closed, the Commission was unable to request an estimate of the number of small businesses that may be affected.

However, as Data-PCS operations evolve, and until the Commission establishes a pertinent definition of small entities, the applicable definition will be under the Small Business Association (SBA) rules applicable to Communications Services, Not Elsewhere Classified. This definition provides that a small entity is expressed as one with $11.0 million or less in annual receipts.[59] According to Census Bureau data, there are 848 firms that fall under the category of Communications Services, Not Elsewhere Classified. Of those, approximately 775 reported annual receipts of $11 million or less and qualify as small entities.[60]

5. ***Summary of Projected Reporting, Recordkeeping, and Other Compliance Requirements:*** The rule adopted in this Fourth Report and Order imposes no reporting or recordkeeping requirements. The rule also requires no affirmative compliance action by any entity to which it applies. Rather, the rule operates as a prohibition on the use of Data-PCS devices in the 2390-2400 MHz band while airborne in the continental United States. We do not predict that any compliance costs, administrative or otherwise, will be imposed on entities subject to this rule.

[59] 13 C.F.R. § 121.201, Standard Industrial Classification (SIC) Code 4899.

[60] U.S. Bureau of the Census, U.S. Department of Commerce, 1992 Census of Transportation, Communications, and Utilities, UC92-S-1, Subject Series, Establishment and Firm Size, Table 2D, Employment Size of Firms: 1992, SIC Code 4899 (issued May 1995).

6. ***Significant Alternatives and Steps Taken to Minimize the Economic Impact on a Substantial Number of Small Entities Consistent with the Stated Objectives:*** The Commission believes that this allocation of Data-PCS spectrum will facilitate the creation of new jobs and economic growth. At the suggestion of commenters, the Commission considered and rejected a complete ban on all use of unlicensed devices in the vicinity of the NAIC. The Commission rejected this alternative as excessively burdensome to small entities using Data-PCS, while of little benefit in protecting space research operations at the NAIC. The Commission also considered and agreed with a recommendation by Apple that manufacturers should not be held responsible for designing Data-PCS devices to cease operations while traveling in aircraft.[61] We believe that this would place an unnecessary burden on the manufacturer and we believe that it will be the responsibility of the user to control when and where the device is used. Data-PCS operations are nascent, and it is not possible to determine the impact this action will have on small businesses, because we have no data on the number of small businesses likely to use Data-PCS.

7. ***Report to Congress:*** The Commission shall send a copy of this Final Regulatory Flexibility Analysis, along with this Fourth Report and Order, in a report to Congress pursuant to the Small Business Regulatory Enforcement Fairness Act of 1996, 5 U.S.C. § 801(a)(1)(A). A copy of this FRFA will also be published in the Federal Register.

[61] See, decision at para. 22.

Appendix D: Commenting Parties

The following parties filed comments to the 2nd NPRM addressing the 2390-2400 MHz and 2402-2417 MHz bands:

1. American Radio Relay League, Inc.
2. Apple Computer, Inc.
3. AT&T Corp.
4. William A. Burns
5. Compaq Computer Corporation
6. Consumer Electronics Group of the Electronic Industries Association
7. Cornell University
8. Cylink Corporation
9. James S. Kaplan
10. Motorola, Inc.
11. Committee on Radio Frequencies of the National Academy of Sciences
12. Northern Amateur Relay Council of California, Inc.
13. Northern California Packet Association
14. The Part 15 Coalition
15. Radio Amateur Satellite Corporation
16. San Bernardino Microwave Society
17. Southern California Repeater and Remote Base Association
18. UTC
19. Nathan Williams

The following parties filed reply comments to the 2nd NPRM addressing the 2390-2400 MHz and 2402-2417 MHz bands.

1. American Radio Relay League, Inc.
2. Apple Computer Corporation
3. AT&T Corp.
4. Consumer Electronics Group of the Electronic Industries Association
5. Mike Cheponis
6. Northern California Packet Association
7. Radio Amateur Satellite Corporation